DEPARTMENT OF AGRICULTURAL, FOOD AND ENVIRONMENTAL SCIENCES

DEGREE COURSE IN: FOOD AND BEVERAGE INNOVATION AND MANAGEMENT

# EYE TRACKING OF SUSTAINABLE PRODUCT LABELS: THE CASE OF AQUACULTURE

TYPE OF THESIS: experimental

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AOI | Areas of Interest (in eye tracking technique). |
| EU | European Union. |
| WTP | Willingness-to-pay. |
| SR | Sustainability-related. |

# INTRODUCTION

The global fish production is facing crucial decisions as the sustainability of the supply is in question. The fish capture has reached the peak and remained relatively static since the late 1980s. The sea capacity had to be taken into consideration as well as aquaculture systems had to emerge. Anyway, currently the prevailing aquaculture systems are often criticized for harming the environment and low animal welfare standards. Thus, customers tend to prefer wild capture over aquaculture produce. It is believed that sustainable approach towards fishery and aquaculture systems is needed to guarantee the sustainability of fish supply and increase customer trust.

As the customer trust towards fish produce, especially of aquaculture origin, is compromised both development of capture and production systems as well as communication towards the public must be ensured. The established **problem** in this paper questions how to increase the efficiency of the sustainable and organic fish produce communication towards customers at the point of sales.

The **objective** of the paper is to analyse the customers' visual attention towards sustainability and organic production labels on fishery and aquaculture produce.

Although global context is also discussed in the paper, anyway, the **scope** of the research remains the EU market. The methods of visual attention examination are restricted to eye tracking technique.

In brief, the **structure** of the paper consists of analysis of relevant background information, systematic literature review and conclusions.

The principal **methods** used to achieve the research objective includes ordinary literature review, statistical analysis, market analysis and systematic literature review.

# CHAPTER 1
# BACKGROUND INFORMATION

## 1.1 **Overview of the global fish supply and production systems**

Historically, the world fish production had been based on capture. Anyway, the capture fishery production has reached the peak and remained relatively static since the late 1980s. Therefore, as the human population have been growing as well as the fish consumption per capita (FAO, 2018) the wild fish availability per capita have been decisively decreasing. Thus, the aquaculture had to step in for feeding the world fish demand. In 2017, for the first time in history the aquaculture production surpassed the fish capture (FAO, 2019b).

Furthermore, the state of wild fish resources is threatening as the populations of marine vertebrates have declined by 49% between 1970 and 2012, with some fish species declining by almost 75%. There are plenty of reasons for such consequences: overfishing, various pollution, global warming, increase in ship traffic, diminishing of corals and seagrasses, etc. (World Wildlife Fund, 2016). Ocean-dwelling species are more fragile to global warming than land-dwelling species (Pinsky, Eikeset, McCauley, Payne, & Sunday, 2019). Ocean acidification (Hall-Spencer & Harvey, 2019) and nanosized plastic particles (Mattsson et al., 2015) are increasingly cutting down the wild fish populations.

Aquaculture development in global context was rapid because of various factors, including:

- The development of the farming techniques allowed decrease in the price of farmed species to a position of an average price level among the most consumed species (Mariojouls & Paquotte, 2000);
- Planned production and regular availability provide an advantage of aquaculture against fisheries (Mariojouls & Paquotte, 2000);
- The lower fish energy requirements cut the amounts of feed comparing with the most of other farmed animals (Fry, Mailloux, Love, Milli, & Cao, 2018);

When considering the global aquaculture production, some insights are necessary to gain a comprehensive understanding. An important issue is that Asia is undertaking the vast majority of the fish production. Recently they produce more than 50 percent of the global fish capture (see the Figure 1-2) and about 90 percent of aquaculture production (see the Figure 1-1).

Although the immense production have contributed to the alleviation of the local poverty, improved protein supply for domestic consumption and the provision of employment for local community, the production was based on large scale intensive aquaculture practises which possesses their drawbacks (Muir, 2005). The large-scale production raises questions of the produce quality and environmental issues (Burridge, Weis, Cabello, Pizarro, & Bostick, 2010; Muir, 2005; Thorpe et al., 2011). Proliferation of viral, bacterial and fungal infections and parasitic pests are common problems in conventional intensive aquaculture systems (Bondad-Reantaso et al., 2005). Solving these problems aquaculture farmers have employed a variety of synthetic and natural chemical and biological treatments including antibiotics, disinfectants, pesticides, fertilizers, water and soil treatment compounds (Gräslund & Bengtsson, 2001). Most of the Asian aquaculture production are connected with the surrounding waters and produce continuous wastewater discharges into them. In consequence, chemicals and biological waste used in the intensive aquaculture systems are released into the surrounding aquatic ecosystems potentially damaging them (Burridge et al., 2010). The capture fisheries sector is also facing challenges originating from overharvesting, invasive alien species, disease and pollution (IPBES, 2018). To sum up, it is projected that if unsustainable aquaculture and fish capture practices continue, there could be no exploitable fish stocks left by 2048 in the Asia-Pacific region (IPBES, 2018).

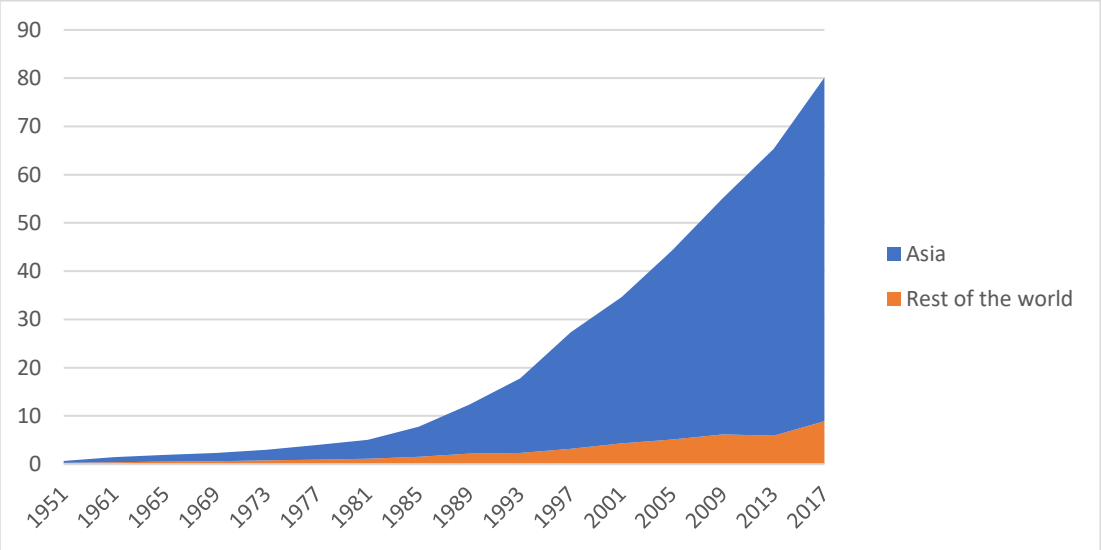


***Figure 1-1: Global aquaculture production (million tonnes) from 1951 to 2017***

*Cumulative graphs. Data extracted from FAO (2019b)*

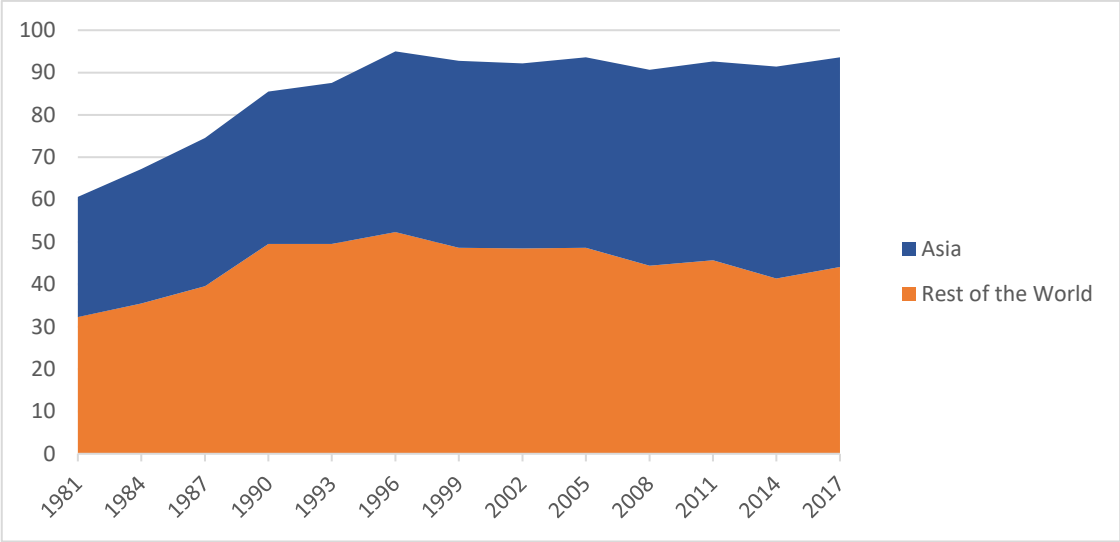


***Figure 1-2: Global fish capture production (million tonnes) from 1981 to 2017***

*Cumulative graphs. Data extracted from FAO (2019c)*

The role of European aquaculture production in the global context is decreasing as the rate of global production is higher (see the Figure 1-3, Figure 1-1 and Figure 1-2). Anyway, the import and production quantities have been similar since 1977 (see the Figure 1-4). Currently, the self-sufficiency rate is over 40% (see the Figure 1-5) which indicates the ratio of domestic production over domestic demand (European Commission, 2018). European fish export is minor compared with consumption, in terms of quantity, but rather significant compared with production (see the Figure 1-6). The European aquaculture production is largely dependent on Norway as they provide more than 40% of European production (see the Figure 1-7). Anyway, the aquaculture development in Europe have been quit sluggish as currently more than 70% of all fish produce originates from fisheries (see the Figure 1-8). The struggles of the aquaculture development may be largely caused by lower produce prices from fisheries and third countries (Bostock et al., 2009).

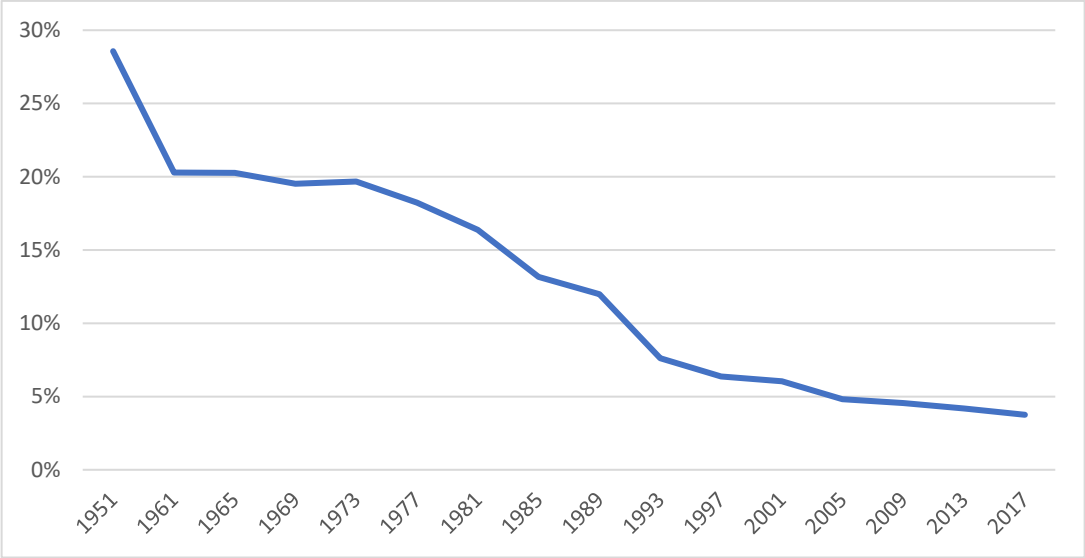


***Figure 1-3: European part of the world aquaculture production (%), 1951-2017***

*Data extracted from FAO (2019b)*

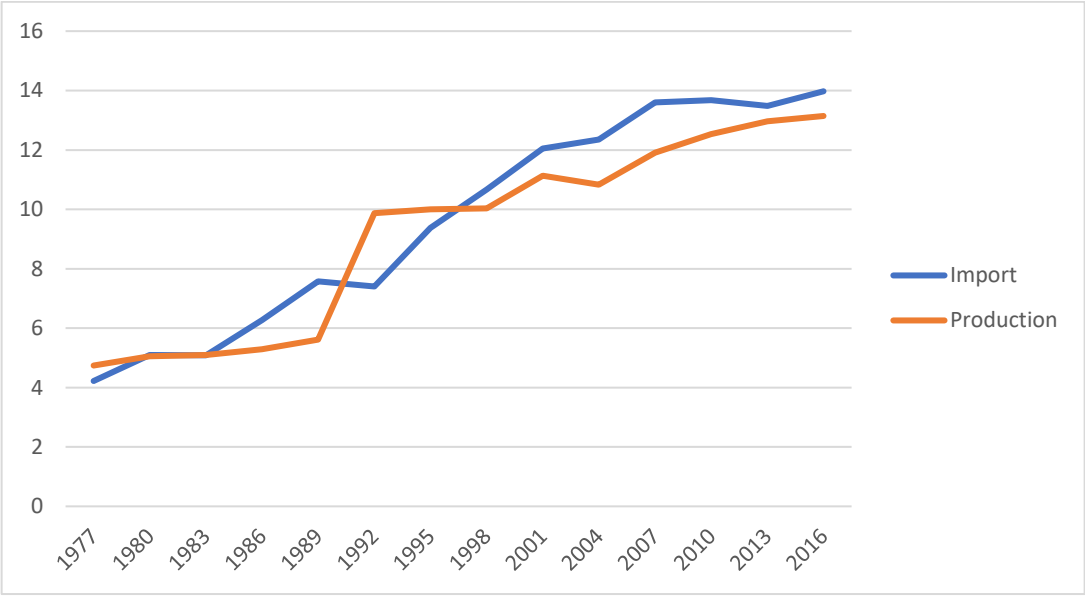


***Figure 1-4: European total fish production and import (million tonnes), 1977-2016***

*Data extracted from FAO (2019a)*

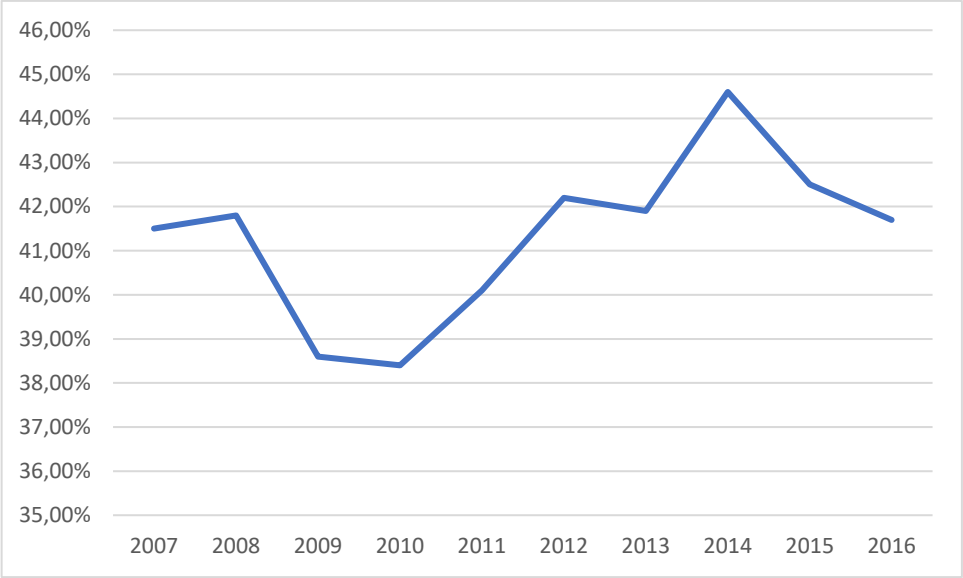


***Figure 1-5: EU fish produce self-sufficiency rate, 2007-2016***

*Adjusted from European Commission (2018)*

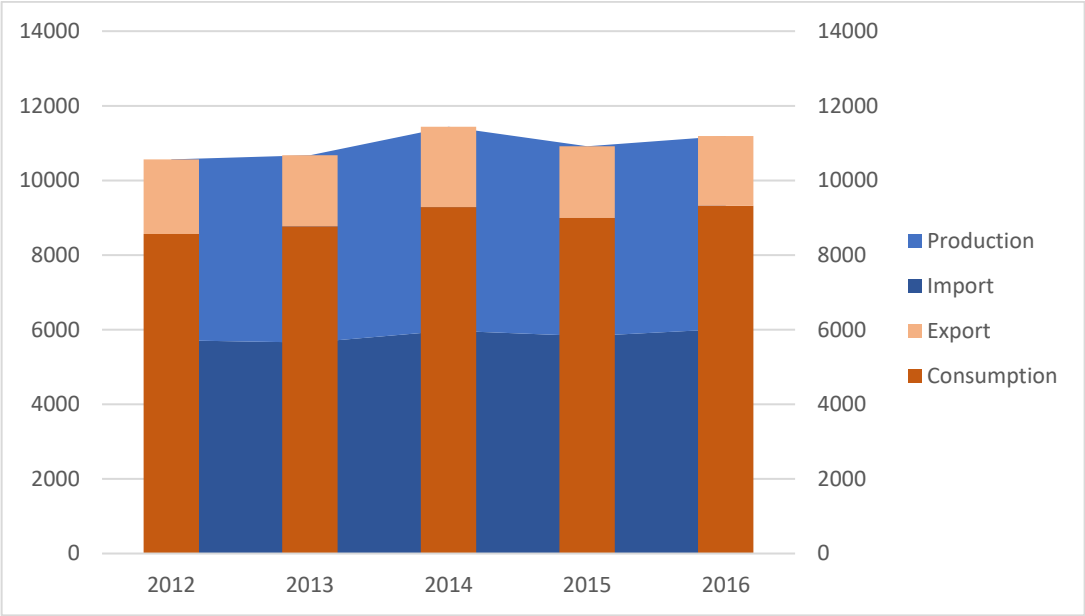


***Figure 1-6: EU fish production and import, consumption and export, 2012-2016***

*Cumulative graphs. Adjusted from European Commission (2018)*

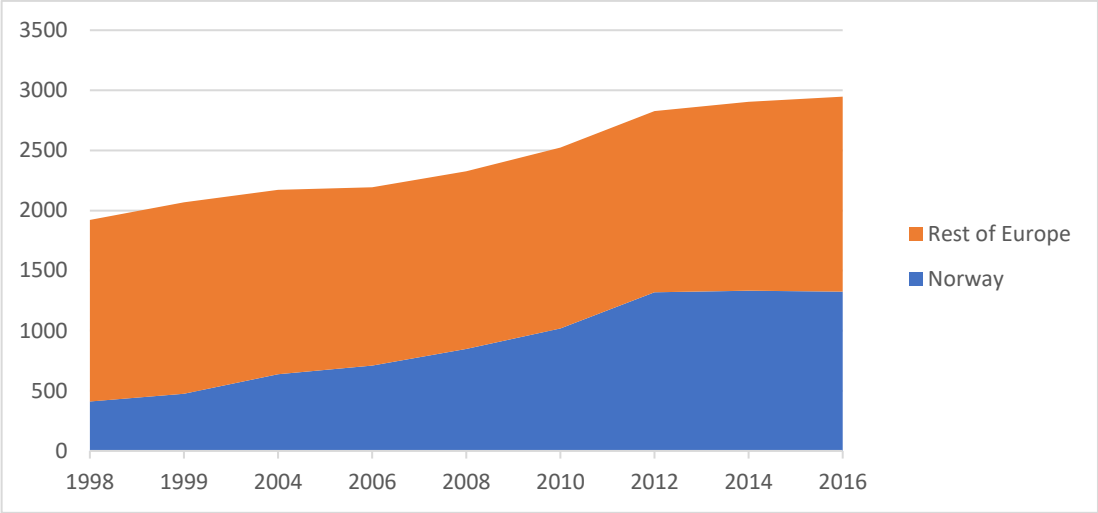


***Figure 1-7: Europe's aquaculture production (thousand tonnes), 1998-2016***

*Cumulative graphs. Data extracted from Eurostat (2019) and FAO (2019b)*

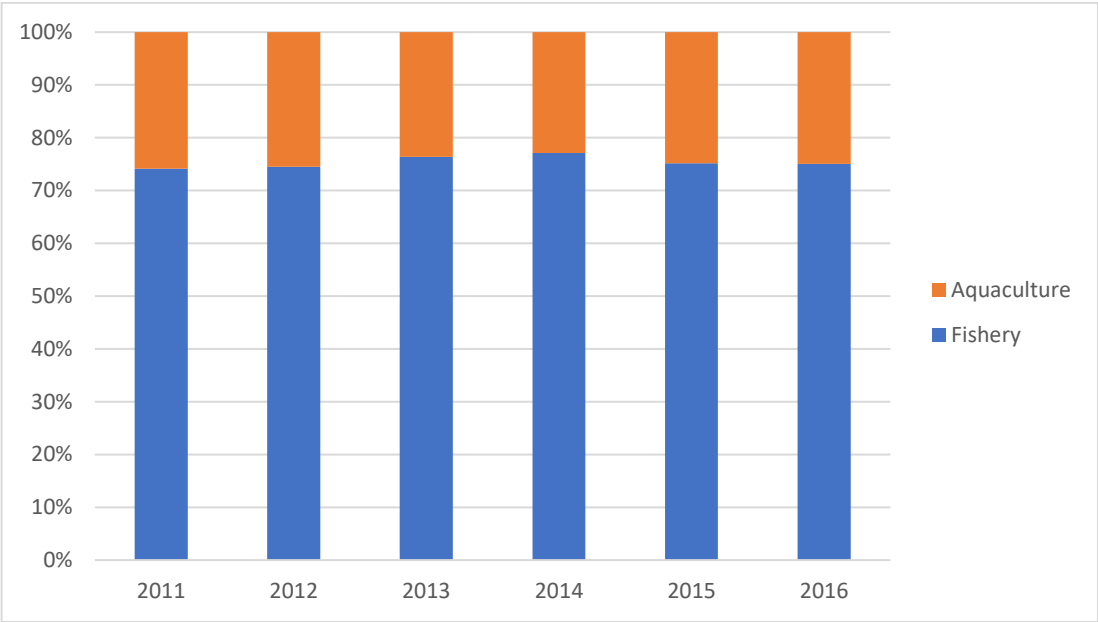


***Figure 1-8: EU fish production structure by origin, 2011-2016***

*Cumulative graphs. Adjusted from European Commission (2018)*

Considering the countries of origin of the EU fish import the detailed data was difficult to find. Anyway, in terms of single countries the highest volumes were delivered from Norway, China, Iceland, US, Vietnam, Morocco, Ecuador, India, etc. (see the Figure 1-9). The EUMOFA report on the EU fish market (European Commission, 2018) indicates that the most

consumed species in the EU – tuna, cod, salmon, Alaska pollock and shrimps – representing 43% of the market in 2016, were mostly imported from third countries.

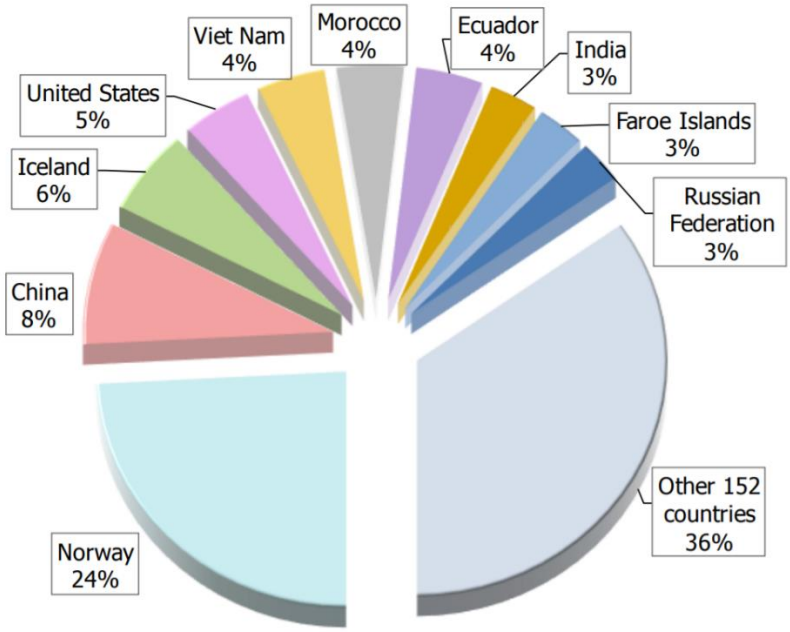


***Figure 1-9: EU import origin countries, 2017***

*Adopted from European Commission (2018*)

All-in-all, the world fish supply is largely dependent on few regions which employs intensive techniques and large-scale production. Meanwhile, the European fish production is still based on fisheries as the aquaculture sector is slowly developing. To enhance the development of European aquaculture sector the diversification strategy in terms of quality could be employed. For successful implementation of this strategy quality certification programs and proper communication have been suggested as a sufficient means (Altintzoglou, Honkanen, & Van Haaster-de Winter, M. Olesen, 2017).

### 1.1.1 *Sustainable aquaculture and fisheries*

As discussed previously, the importance of aquaculture was crucial for fish production, anyway, aquaculture cannot be a sustainable alternative when carried out in an inappropriate way. In many countries, aquaculture production has depleted key ecosystems like mangroves, polluted aquatic environments, potentially reduced climate change resilience for coastal communities (World Wildlife Fund, 2016). Large amounts of synthetic chemicals (Costello et al., 2001) and drugs (Boxall, 2004) used, dense habitation (Costello et al., 2001) and other

intensive farming means have harmed the environment and caused negative consumers' perceptions towards the aquaculture practise in general (Verbeke, Sioen, Brunsø, Henauw, & Camp, 2007).

Since the 1990 various international organizations, activists, and researchers have repeatedly highlighted overexploitation of fish stocks around the world and the impact of intensive fishing practise on the aquatic environment (Campling, Havice, & Mccall Howard, 2012). In consequence, fishery management systems have been introduced under public authority and legal frameworks, such as the FAO Code of Conduct for Responsible Fisheries, which provides principles for ensuring sustainable exploitation of marine resources, have been suggested (Ponte, 2012). However, the implementation of these tools were poor, thus voluntary codes of conduct and market-based instruments, including certification systems and quality labels have emerged (Allison, 2001). Anyway, according to some researchers, these market oriented tools does not motivate adequate levels of improved governance and environmental improvements needed in many fisheries, especially in developing countries (Roheim, Bush, Asche, Sanchirico, & Uchida, 2018).

There are plenty of sustainable fishing standards which incorporates different views. Anyway, in general, according to FAO (WECAFC, 2002) sustainable fisheries development can be achieved through responsible fishing, which considers rational fishery management objectives that address a range of issues including the status of the resource, the health of the environment, post-harvest technology and trade, as well as other economic concerns, social benefits, legal and administrative support.

Although cultivation of sustainable fisheries and aquaculture practices are growing worldwide, the current part of total fish production is still rather small – around 15% in 2015. It is estimated that between 2003 and 2015, certified sustainable seafood (both aquaculture and wild catch) grew from 500,000 tonnes (0.5% of total global production) to 23 million tonnes (14% of total global production) at rate 10 times faster than the growth of global seafood production over the same time period (Potts, Wilkings, Lynch, & McFatridge, 2016).

### 1.1.2 *Organic aquaculture*

Regulations for organic aquaculture at EU level have entered into force rather lately in 2010 (European Commission, 2009). Thus the development of organic aquaculture practise were slower than of organic agriculture.

There are different organic aquaculture certification programs possessing different standards, although basic principles are similar. Usually those standards include requirements such as (European Commission, 2009):

- Organic fish production is possible only in case of aquaculture;
- Feed must be is organically produced or derived from sustainably managed fisheries;
- Limits for stock densities in fish cages are lower than in case of conventional aquaculture;
- Use of induced spawning by artificial hormones is not allowed;
- Prohibition of treatments involving synthetic chemicals for the control of hydrophytes and plant coverage present in production waters;
- The total production of species in inland waters is limited to 1500 kg of fish per hectare per year;
- Respect for biodiversity;
- Etc.

Usually private organic certification programs in Europe complies with the EU organic regulation and the conformity is certified by an officially accredited inspection body. Moreover, private standards for organic agriculture (for example *Naturland*, Germany) are commonly set beyond the minimum requirements of EU organic aquaculture standards. The standards of concern includes social standards, stocking densities, requirements for the protection of biodiversity, etc (Naturland, 2016).

The organic fish production and consumption in Europe is of very low amounts (see the Figure 1-10) and constitute only around 5% of the total aquaculture production of six major species (carp, salmon, seabass, seabream, trout, mussels) and around 2% of total aquaculture production. In recent years, between 2012 and 2015 organic production increased by 24% for salmon, doubled for rainbow trout, and tripled for seabass/seabream (EUMOFA, 2017).

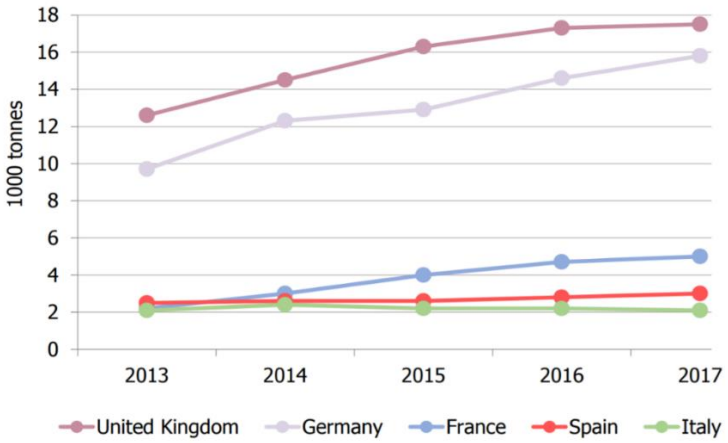


***Figure 1-10: Consumption of organic fish in several EU countries, 2013-2017***

(European Commission, 2018)

## 1.2 **Sustainability-related and organic fish produce labels in EU markets**

There is a lack of clear and common sustainability label concept explanation in scientific literature. There are different normative perspectives on sustainable development identified (Noorman & Uiterkamp, 1998) and different opinions as to what sustainability means in practice and how it should be promoted and evaluated (Risku-Norja & Mäenpää, 2007; Söderbaum, 2007).

In general, the sustainability concept integrates the three dimensions of environmental, social and economic development (Cassen, 1987), thus Engels, Hansmann, and Scholz (2010) suggest that likewise should the sustainability labels. Thus, sustainability labels on food produce should indicate that a labelled product have less impact on environment, is healthier for human consumption, is socially fair, do not possesses threats on economic development, etc. In this paper we consider a sustainability label to be a production or life cycle certification label which provide benefits or reduce harm according to all of the three dimensions. Anyway, when researching the quality labels we also consider the certification programs which involves at least one of the dimensions and strive to present themselves as solutions for sustainable development. They are called sustainability-related (SR) labels or certification programs in this paper.

A more common concept of ecolabels comprising environmental issues do not fairly cover the other two dimensions and thus could not be completely considered as sustainability label. Anyway, the concept made important influence on development of sustainability labels. The Organisation for Economic Co-operation and Development (Salzman, 1991) have proposed the concept of ecolabels as seals of approval given to products that have demonstrated to have fewer impacts on the environment than functionally or competitively similar products. Ecolabels generally are considered to be based on life-cycle assessment to determine the environmental impact of a product during the all production processes as well as disposal or recycling (Staffin, 1996). The usefulness of ecolabelling schemes to create incentives for environmentally friendly production was internationally acknowledged at The United Nations Conference on Environment and Development, known as Earth Summit, in Rio, in 1992 (Wessels, Cochrane, Deere, Wallis, & Willmann, 2001). A European-wide eco-labelling scheme was introduced by the European Commission in 1992 as a part of the fifth Environmental Action Plan (European Commission, 1992).

In 2012, 129 public and private SR food information schemes were identified at the EU or national levels (European Commission, 2012).

Sustainability label programmes could be categorized by their origin into the following categories (Wessels et al., 2001):

a) **First party labelling schemes or 'self-declaration'**: these are established by individual companies;
b) **Second party labelling schemes**: these are established by industry associations and used by the member companies;
c) **Third party labelling schemes**: these are established by a public or private person, independent from the food business operators.

Labelling of fishery and aquaculture products were determined both by increasing market competition and the need for consumer reassurance (Mariojouls & Paquotte, 2000). One of the first cases where labelling of fishery products was introduced were in France, in 1990s (Charles & Boude, 2001). But the EU regulations on organic aquaculture were entered into force only in 2010 (European Commission, 2009), thus plenty of time were left for the national authorities and private organizations to establish various aquaculture certification schemes and labels (Mariojouls & Paquotte, 2000).

There are plenty of different SR and organic labels present in European fish markets. To evaluate the variety and determine the most prevailing ones we have analysed available online markets in twelve European countries: Germany, Denmark, France, Greece, Hungary, Italy, Lithuania, Netherlands, Norway, Spain, Sweden and UK (see the Table 1-1). Plenty of fish produce items were screened for identification of SR or organic labels.

***Table 1-1: Organic and SR aquaculture and fisheries labels present in European markets and found during screening of the online markets***

*Germany, France, Italy, Lithuania, Norway, Spain, Sweden and UK*

| Category | Label | Countries | System |
|---|---|---|---|
| Organic | EU organic leaf | Germany, France, Italy, Spain, Sweden, UK | Aquaculture |
| | Bio-Siegel | Germany | |
| | Naturland | Germany | |
| | Textual indication | UK | |
| | Soil association | UK | |
| | CAAE | Italy | |
| | ICEA | Italy | |
| | Agricultura ecoloxica | Italy, Spain | |
| | Agriculture biologique | France | |
| | KRAV | Sweden | |
| | Okologisk debio | Norway | |

| | | | |
|---|---|---|---|
| Sustainability | MSC | Germany, France, Italy, Lithuania, Norway, Spain, Sweden, UK | Wild capture |
| | GGN | Germany | Aquaculture |
| | ASC | Germany, France, Italy, Lithuania, Norway, Spain, Sweden, UK | Aquaculture |
| | Friend of the Sea | Germany, Italy | Both |
| | Naturland wildfisch | Germany | Wild capture |
| | WWF | Germany | Both |
| | Private labels | Italy, Spain, Sweden, UK | Both |
| | Sustainable seafood coalition | UK | Wild capture |
| Sustainability-related | Fairtrade | Germany | Wild capture |
| | RSPCA (animal welfare) | UK | Aquaculture |
| | Captured by rod | Germany, Spain, Sweden, UK | Wild capture |

### 1.2.1 *Prevailing EU labels*

The EU organic label (see the Figure 1-11) is commonly used in all EU Member States. It was established in 2009 for aquaculture products (European Commission, 2009) laying down detailed rules on organic aquaculture animal and seaweed production. This regulation entered into force on July 1, 2010 and the labelling of organic products became mandatory.

***Figure 1-11: The official EU organic logo***

*(European Commission, 2019)*

The Marine Stewardship Council (MSC) is the dominant sustainability certification system in fisheries industry (see the Figure 1-12; Ponte (2012)). The Council were established in 1997 by Unilever and WWF (Mariojouls & Paquotte, 2000). Anyway, in 1999 the Council became independent of its founders (Marine Stewardship Council, 2019a).

The MSC fisheries standard has three core principles (Marine Stewardship Council, 2019b):

1) Sustainable fish stocks - fishing must be at a level that ensures it can continue indefinitely and the fish population can remain productive and healthy;
2) Minimising environmental impact - fishing activity must be managed carefully so that other species and habitats within the ecosystem remain healthy;

3) Effective fisheries management - MSC certified fisheries must comply with relevant laws and be able to adapt to changing environmental circumstances.

***Figure 1-12: The official MSC logo***

*(Marine Stewardship Council, 2019c)*

Another prevailing label – ASC (see the Figure 1-13) – was developed in 2009 under the auspices of the WWF. It is designed for aquaculture systems (Aquaculture Stewardship Council, 2019c). The standards were devised by fish farmers, environmental experts and other groups. They cover both the environmental and social impact of farming. Farms must show that they actively minimise their impact on the surrounding natural environment - carefully manage the fish health and resources. Moreover, farms must operate in a socially responsible manner, caring for their employees and working with the local community (Aquaculture Stewardship Council, 2019b).

***Figure 1-13: The official ASC logo***

(Aquaculture Stewardship Council, 2019a)

The GGN label (see the Figure 1-14) resembles the rules of GLOBALG.A.P aquaculture standards. GGN stands for a thirteen-figure identification number by which all certified participants in the production and supply chain can be recognised (GLOBALG.A.P., 2019c). The standards relate to all species of fish, shellfish and molluscs and covers the entire production chain - from spawner stocks and fry to suppliers of feed and on to farming, catching and processing (GLOBALG.A.P., 2019b).

***Figure 1-14: The official GGN logo***

(GLOBALG.A.P., 2019a)

The Friend of the Sea label (see the Figure 1-15) is a project of the World Sustainability Organization, an international trademark registered with humanitarian and environmental conservation mission. Friend of the Sea covers sustainable systems of fisheries, aquaculture, fishmeal and omega 3 fish oil production (World Sustainability Organization, 2019a). The standards for fisheries include (World Sustainability Organization, 2019d):

- Avoid overexploiting the target stock;
- Avoid significant impact on the seabed;
- Use selective fishing gear;
- Avoid bycatch listed as 'vulnerable' or worse in the IUCN Redlist;
- Comply with legal requirements (including TACs, no IUU, mesh size, minimum size, etc.);
- Manage waste and energy;
- Comply with social accountability.

The standards for aquaculture include (World Sustainability Organization, 2019c):

- Avoid impact on critical habitat (e.g. mangroves, wetlands, etc.);
- Comply with water quality parameters;
- Reduce of escapes to negligible levels;
- Avoid use of harmful antifouling nor growth hormones;
- Comply with social accountability;
- Reduce the carbon footprint.

***Figure 1-15: The official Friend of the sea logo***

(World Sustainability Organization, 2019b)

There are also WWF partnership for sustainable seafood label (see the Figure 1-16). WWF works with suppliers that participate in and support fishery and aquaculture improvement projects and are committed to transition fisheries and farms in their supply chains (World Wildlife Fund, 2019).

***Figure 1-16: The WWF partnership logo***

(World Wildlife Fund, 2016)

1.2.2 *France*

I have analysed fish products from two well-established online shops in France:

1) Carrefour.fr
2) Auchan.fr

There are at least two organic labels present on fish produce in French markets: EU organic leaf and the national *Agriculture biologique* label. Regarding the sustainability labels there are *MSC* and *ASC* labels present.

Moreover, French market has plenty of national labels of other type. They include *Label Rouge*, *Conformité produit*, *Saveurs en 'Or*, *Nutri-score*, *Produit en Bretagne*, *Atlantic Ocean*, *Fish from Norway*, Non-GMO, wild fish and other private labels. The labels indicates place of origin, nutritional characteristics or some other production standards.

In the private sector, the biggest retail chain *Carrefour* was a pioneer in introducing its own sustainability label *Responsible fishing*. After *Carrefour* launched its label for cod products,

in 2004, it attracted much media attention, being the only retail chain to go that far (Salladarré, Guillotreau, Perraudeau, & Monfort, 2010).

### 1.2.3 *Germany*

I have analysed fish products from six well-established online shops in Germany:

1) All-bio.de
2) Lieferladen.de
3) Shop.rewe.de
4) Mytime.de
5) Edeka24.de
6) Supermarkt24h.de

There are several organic labels present in Germany market, including EU organic label and the national organic label *Bio-Siegel*. The sustainability labels MSC, GGN, ASC, Friend of the Sea, Naturland wildfisch and WWF are also present on the German market as well as sustainability related: captured by rod and *Fraitrade* labels.

One of the shops have indicated the "Naturland" label to be of higher value than the EU organic label (REWE, 2019). The "Naturland" association successfully introduced guidelines for organic aquaculture in the mid-nineties. Now they have also established the "Naturland Wildfisch" certification on small craft and exemplary fisheries (Naturland, 2019).

The Bio-Siegel label is the official national Germany organic agriculture and aquaculture label. The label was established prior to the EU organic label. The Bio-Siegel label continues to be an effective marketing instrument and it may continue to be used unchanged and in connection with the EU organic farming logo (BLE, 2019).

In Germany, there are also several first- and second-party labels indicating some advantages of the fish products: "Pro Planet"(Rewe supermarket), "Qualität mit verantwortung" (Bolton food), "Pole & line" (Bolton food), "Bewusste fischerei qualitätssiegel" (Bünting Unternehmensgruppe), etc.

Another interesting label related to animal health is the *Dolphin safe label*. The label's tuna program were established in 1990 by the Earth Island Institute. The program aimed to set the worldwide standards to stop the chasing, killing and setting of nets on dolphins. More than 95 percent of tuna companies in the world are now committed to Dolphin Safe fishing standards (Earth Island Institute, 2019).

### 1.2.4 *Italy*

I have analysed fish products from seven well-established online shops in Italy:

1) Conad.it
2) Naturasi.it
3) Sorgentenatura.it
4) Eataly.net
5) cicalia.com
6) auchan.it
7) carrefour.it

There are several organic labels on fish produce present on Italian market, including EU organic label, *CAAE, ICEA* and the Spanish *Agricultura ecoloxica* label. Regarding the sustainability labels there are *MSC, ASC, Friend of the* sea and various private labels present on the market.

ICEA inspects and certifies several thousand companies that carry out their activities in respect of individuals and the environment, protecting the dignity of workers and consumer rights. ICEA was born from the experience of Italian Association for Organic Farming. ICEA proposes the development of schemes, regulations, specifications, and measures to support the growth of companies in the field of sustainability and corporate responsibility (ICEA, 2019).

Other first- and second-party labels include *Sea action, Qualita tonno, Qualita esclusiva per l'italia, Pesca sostenibile, Lavorato complemente in italia, Pescato nell'Oceano Atlantico Sud-Orientale, Dolphin safe, Wild caught, etc.*

### 1.2.5 *Lithuania*

I have analysed fish products from three well-established online shops in Lithuania:

- Barbora.lt
- Assorti.lt
- Intermarket.lt

None of organic labels was detected in Lithuanian market on fish produce although there organic pond aquaculture in Lithuania has existed since 2003 but the most of their produce are exported (EUMOFA, 2017).

There are sustainability labels *ASC* and *MSC* present on the market.

An interesting label in northern Europe region is the Keyhole label which indicates the nutritional value of a food. This logo is particularly used in Sweden, Denmark, Norway, Iceland, Lithuania and also North Macedonia. It was established by the Sweden national food agency in 1989. The objectives are twofold: helping consumers make healthier food choices and stimulating manufacturers in healthier reformulations (reduced levels of sugar, salt,

saturated fats, trans fats, no use of sweeteners, increased levels of fiber, etc.). The logo usage is voluntary and free but requires compliance with established standards. The standards in all participating countries are the same (Lithuanian Ministry of Health, 2019).

Another labels include some first- and second-party labels such as *100% natural* and *Hand made*.

### 1.2.6 *Norway*

I have analysed fish products from four well-established online shops in Norway:

- kolonial.no
- joker.no
- spar.no
- meny.no

The organic labels on the Norway market include the national *Okologisk debio* label. Debio is the only organic certification body in Norway. They ensure that farms and fish farms, processing and marketing enterprises, importers and others follow the EU regulations for organic production and meet the requirements for marketing organic products under Debio's label (Debio, 2019).

The sustainability labels include *ASC* and *MSC*. There are also *Dolphin safe* label present as well as many first- and second-party labels: *Lykkes med sjomat, Wild fish, Loin: den beste delen av fisken, Omega-3, Garantert superfersk,* etc.

### 1.2.7 *Spain*

I have analysed fish products from two well-established online shops in Spain:

- Elcorteingles.es
- Carrefour.es

The organic labels in Spain market include the EU organic and *Agricultura ecoloxica* labels.

The sustainability labels include *ASC, MSC* and *Captured by rod*. *The label Crianza de nuestros mares* indicates that the fish produce originates from Spain (APROMAR, 2019).

CAAE is the Certification Body specialized in Ecological Production which certifies more than 1,000,000 hectares in Europe. The main task of CAAE is the developmenzt of Certified Organic Agriculture and Livestock, ensuring the quality of products under the Ecological Agriculture and contributing to the improvement of the competitiveness of companies in Andalusia, La Mancha and Extremadura Regions through innovation and technological

development. Rural Development and Environment Protection are also included in their tasks (La Frubense, 2019).

Other labels include *From Norway, Save Dolphins, Wild capture, CC Calidad Controlada*, etc. The first- and second-party labels include *Quality and origin, Una garantia de bigotes, Responsible policy*, etc.

### 1.2.8 *Sweden*

I have analysed fish products from four well-established online shops in Sweden:

- Mat.se
- coop.se
- willys.se
- hemkop.se

The organic labels include EU organic and the national KRAV labels.

KRAV is a private organic label popular in Sweden. The KRAV standards fulfil the EU regulations for organic production. In some cases KRAV standards are stricter than the EU standards. The standards are included in IFOAM Family of Standards (KRAV, 2019).

The sustainability labels include *MSC* and *ASC*. The first- and second-party labels include *Wild capture, Omega-3, Dolphins safe, Domstein Miljögaranti*, etc.

### 1.2.9 *UK*

I have analysed fish products from four well-established online shops in UK:

- Ocado.com
- Tesco.com
- Groceries.asda.com
- Sainsburys.co.uk

Organic labels include EU organic, Soil association and textual label with no certification body included on the front of package. Sustainable labels include *ASC*, *MSC* and Sustainable Seafood Coalition labels.

The Sustainable Seafood Coalition is not indeed a certification scheme or a label. Anyway, visualization may be used to indicate membership to this coalition. The history of the coalition began in 2010, when a non-profit, environmental law organisation “ClientEarth” found that seafood brands and retailers made misleading claims on fish produce found in UK supermarkets (32 out of 100 reviewed items carried misleading claims). Thus, in 2011

“ClientEarth” together with some major retailers and seafood operators formed the Sustainable Seafood Coalition. All members commit to two codes – the Responsible Sourcing Code and the Environmental Labelling Code. Similar industry initiatives were also launched in Hong Kong and Spain in 2018 with help of the “ClientEarth” (Sustainable Seafood Coalition, 2019).

An interesting animal welfare label RSPCA is present in UK market. The RSPCA Assured label identifies food from animals farmed by RSPCA welfare standards including indoors or outdoors, conventional and organic. 96% of people recognise the RSPCA brand, making it the most recognised charity in the UK. It is the only farm assurance scheme in the UK dedicated solely to improving farm animal welfare (RSPCA, 2019).

Some first- or second-party labels include *Good health*, *Pole & line*, *Responsibly sourced*, etc.

### 1.3 **Customers’ perceptions towards sustainable and organic fish**

The communication towards aquaculture products have always been a difficult issue. The aquaculture business operators used to conceal whether the fish was farmed or fished. They assumed that consumers were of better opinion towards wild fish than the farmed one. Certainly, the unfavourable perceptions towards aquaculture were caused by the issues with intensive conventional aquaculture (Mariojouls & Paquotte, 2000).

European Commission have funded the scientific project “OrAqua” coordinated by “Nofima” AS (European Commission, 2017). The first partial aim of the Work Package 3 was to assess consumer perceptions, sentiments and understanding of organic aquaculture to promote consumer confidence and acceptance of organic farming principles (European Commission, 2016). The main findings of the latter aim were the following:

- Consumers have lack of knowledge towards general fish production systems and cannot indicate clear differences between them;
- There is a group of consumers who pay attention to the issues of fish welfare so they should be considered in marketing and communication activities;
- The main motivating factors for consuming organic fish are environmental issues and health concerns;
- Consumers express interest in the impact of feed on fish quality;
- The issues of naturalness, cleanliness and water quality in organic aquaculture are complex, thus occasional communication towards these issues should be avoided;

- Consumers possesses a generally negative opinion about the impact of aquaculture practices on the environment and they prefer wild capture to aquaculture production;
- The EU organic label is currently less effective than the national certification schemes as it has the lowest standards and cannot cover the national schemes;
- Some surveys show that consumers express WTP a premium for organic fish products;

## 1.4 **Eye tracking method in marketing and customer research**

### 1.4.1 *Introduction to the eye tracking approach*

Eye tracking is a rather new research method which became more widely accessible since the beginning of the twenty-first century (Bojko, 2013). It helps researchers understand a person's visual attention – where does he look, how long does he look at a particular point, and what is the path of his gaze movements (Schall & Romano Bergstrom, 2014).

Eye movements are not smooth but composed of two separate elements: fixations and saccades. Saccades are jumps between fixed positions. They are very quick, so the vision is mostly suppressed during the saccades. Visual information is only gained during fixations, which happen when the eyes are relatively motionless and the gaze is focused on an object (Bojko, 2013). The fixations take place in the foveal vision (see the Figure 1-17), which accounts for nearly half of the visual information sent to the brain. This part of the vision is highly detailed and provides high clarity about the gaze object. Human primary attention is usually focused on the foveal vision (Schall & Romano Bergstrom, 2014). Thus, it is possible to detect a particular point of gaze which is most often aligned with the focus of attention at that moment (Findlay, 2009).

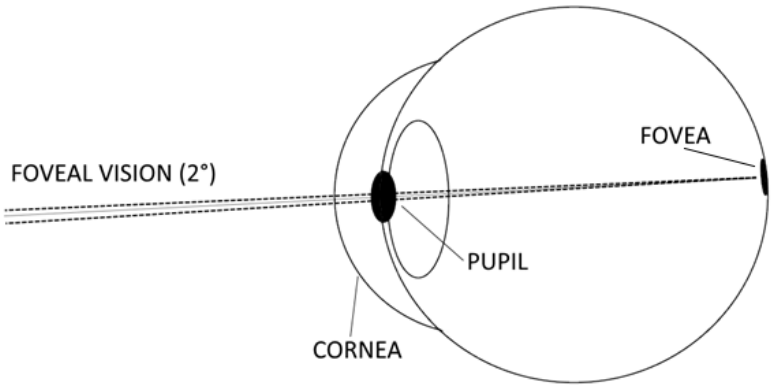


***Figure 1-17: Basic eye anatomy and the foveal vision***

(Adjusted from: Bojko, 2013; Schall & Romano Bergstrom, 2014)

In order to track the eye gaze positions, the eye tracking devices, based on the Pupil-Centre Corneal-Reflection (PCCR) method, are used. During this method, most often an infrared light is used to illuminate the eye, which then causes a reflection that is detected by a camera sensitive to the near-infrared light. The image captured by the camera is then used to identify the reflection of the infrared light on the cornea and the pupil. Advanced image processing algorithms are then used to figure out the point of gaze (Schall & Romano Bergstrom, 2014).

There are several limitations of the eye tracking method which should be kept in mind while doing the eye tracking research. One of the limitations of eye-tracking is that it cannot tell us about the cognitive processes underlying eye movements. The fact that a person places his gaze on a point does not necessarily means that he pays attention to it (Bojko, 2013). And when a person does not focus his gaze on a specific element that does not yet mean that he is not interested in the element, as the non-attending may also be caused by abundant familiarity when further examination is unnecessary (Rosbergen, Wedel, & Pieters, 1999). Anyway, a common belief that consumers spend more time viewing products that are more important to them persists (Meißner & Decker, 2010).

Another important limitation of eye tracking is that it only captures foveal vision and does not gather any information about what was noticed with the peripheral vision (right outside the foveal vision; Bojko, 2013)). Wästlund, Shams, and Otterbring, (2018) believes that peripheral vision is used to direct the foveal vision when discriminating between target and non-target objects.

Therefore, some other additional research methods are commonly coupled with eye tracking to gain more comprehensive findings (Bojko, 2013).

### 1.4.2 *Attention*

Attention is defined as a degree to which consumers focus on a specific stimulus within their range of exposure (Solomon, Bamossy, & Askegaard, 2002). A common classification of the origin of the attention has been established (Bojko, 2013; Clement, Kristensen, & Grønhaug, 2013):

- **Top-down attention**. This kind of attention is knowledge driven and relies on a person's previous experience and expectations. A person intentionally chooses to look at information that he finds to be interesting to him. A particular task or motivation is also considered as top-down factor. While eye movements are task-dependent – the same person would look at the same object differently when given a different task. Top-down factors may be customer involvement, familiarity, expectations and other customer-related factors.
- **Bottom-up attention**. This kind of attention is stimulus driven. In this case attention is cached by objects which contrast with their environment. For example, bright colours in dark font or movement in static surroundings can catch a person's attention. The bottom-up factors consist of size, colour, shape, etc.

Some top-down factors, such as exposure time (Bigné, Llinares, & Torrecilla, 2016) depend on both the customer and the presentation format, which is a bottom-up factor (Elsen, Pieters, & Wedel, 2015).

Similarly to the concept of top-down and bottom-up attention, Chandon, Hutchinson, Bradlow, and Young (2009) have defined in-store factors and out-of-store factors. The in-store factors were defined as factors that influence consumers through in-store visual attention. They correspond to the basic shelf management decisions that retailers make for a given brand, while keeping the total space devoted to the category constant. They include the number of facings of the brand, its vertical position in the display, its horizontal position on the shelf, and its price. Out-of-store factors were defined as the factors that influence consumers through memory activation. These factors are brand specific (market share), consumer specific (shopping goal, criteria and demographics) or vary across both brand and consumer (previous brand usage experience).

There are broadly accepted four major stimuli characteristics which impact customers' attention (see the Table 1-2).

***Table 1-2: Various bottom-up stimuli characteristics***

| Factor | Examples of the effect | Reference |
|---|---|---|

| | | |
|---|---|---|
| Position | Follow the subject's reading system, such as the Western system of left to right and up to down | Orquin & Mueller Loose, 2013 |
| | The first gaze is commonly focused to an element on the central position | Atalay, Bodur, & Rasolofoarison, 2012; Husić-Mehmedović, Omeragić, Batagelj, & Kolar, 2017 |
| | Advantage for verbal stimuli perceived from the right-hand side, and for non-verbal stimuli perceived from the left-hand side | Rettie & Brewer, 2000 |
| Saliency | Distinctive package elements (contrast, colour, shape, orientation, etc.) attract more customers' attention | Bialkova & van Trijp, 2011; Clement et al., 2013; Garber, Lawrence L., Burke, Raymond R., Jones, 2000; Orquin & Mueller Loose, 2013 |
| Surface size | The bigger the element the more attention it receives | Chandon et al., 2009; Orquin & Mueller Loose, 2013; Rebollar, Lidón, Martín, & Puebla, 2015 |
| Visual clutter | Specific package attributes are less attractive in more cluttered contexts | Bialkova, Grunert, & van Trijp, 2013; Orquin & Mueller Loose, 2013; Visschers, Hess, & Siegrist, 2010 |
| | Less cluttered packages attract more attention | Husić-Mehmedović et al., 2017 |

While the eye movements are task-dependent, the shopping goal is an important factor affecting consumer attention and choice (Bialkova et al., 2014).

### 1.4.3 *Decision of purchase*

There are different believes about the process of purchase choice. The choice has been traditionally assumed to be conscious and rational process – making the choice, customer evaluates a series of attributes and tries to maximize the utility or minimize losses (Dieckmann, Dippold, & Dietrich, 2009; Elrod, Johnson, & White, 2004). On the contrary, other researchers argue that customer have a limited capacity and resources to process the information and most frequently relies on effortless, intuitive thinking with limited consideration and information processing (Fitzsimons et al., 2002; Grunert, Wills, & Fernández-Celemín, 2010; Milosavljevic & Cerf, 2008). Moreover, Song et al., (2019) after producing an eye-tracking study on consumer visual attention at a real market setting found that majority of the customers rely on habitual shopping for product selection and do not make decisions on the spot.

There are plenty of various opinions towards whether attention relates with purchase choice. Aribarg, Pieters, & Wedel, (2010) argue that the level of attention to a given brand on a shelf, measured by the use of eye-tracking, is related to the subsequent purchase choice. Kumar & Garg, (2010) found that when the design reflects the principles of harmony and typicality it both attracts attention and is positively evaluated. Stoll, Baecke, & Kenning, (2008) as well as Reimann, Zaichkowsky, Neuhaus, Bender, & Weber, (2010) state that an attractive package design captures more attention than an unattractive one and moreover, attractive design leads to positive evaluation and preference of that item. But on the other hand, according to Schoormans & Robben, (1997) negatively evaluated designs might also attract a lot of attention. Similarly, Orquin & Mueller Loose, (2013) concluded that eye movements do not have a causal effect on preference formation. However, they add that bottom-up factors do lead to some effects on decision making. More recently, Husić-Mehmedović et al., (2017) found that packages attracting the most of attention received average scores on likeability criteria and other packages were preferred over them. Anyway, the results from this study may be difficult to interpret as well-known package design were used, thus enabling a lot of influence of the top-down factors and also, no particular task or motivation were given to the participators while looking at the packages. Moreover, it was already discussed here, that non-attending might also be caused by abundant familiarity, when further examination is unnecessary (Rosbergen et al., 1999). Although, this issue remains unclear as Van Loo et al., (2015) by employing both eye tracking and survey methods found that consumers who spend more time attending to and fixate more on sustainability attributes also value them more.

Hence, eye tracking research should be accompanied by the final choice of purchase as the most notable packages attracting the most attention might not necessarily be positively evaluated.

### 1.4.4 *Research setting*

Eye tracker sampling rate is measured in hertz (Hz). It shows how many times the eye tracker registers the person's gaze location per second. For user experience research 50–120 Hz sampling range is an appropriate choice. These sampling rates will produce a fixation duration error of 10 ms or less. A typical fixation lasts between 100 and 500 ms, thus an error of that magnitude is generally acceptable in user experience field (Bojko, 2013).

There are plenty of alternative settings used in marketing research. Those settings must be coupled with appropriate eye trackers (see the Table 1-3). Every setting and eye tracker combinations have its own pros and cons towards research validity and scientific control and ease of analysis (Bojko, 2013). Both factors were equally important during this research, so

we have chosen to display product items in a lab setting and use wearable eye trackers for the gaze tracking to gain average validity and average scientific control.

***Table 1-3: Types of different setting and eye tracker combinations for items on shelves analysis***

*Adjusted from Bojko, 2013*

| **Setting** | **Eye tracker** | **Validity** | **Control** |
|---|---|---|---|
| Shelves in a real store | Wearable | Highest | Lowest |
| Shelves in a mocked-up store | Wearable | High | Low |
| Shelves in a lab | Wearable | Average | Average |
| Real size image of shelves in a lab | Remote | Low | High |
| Image of shelves displayed in a computer screen in a lab | Remote | Lowest | Highest |

According to Chandon et al., (2009), in-store visual factors have influence on the customers' choice. Those factors include the basic shelf management decisions such as the number of facings of the brand, its vertical position in the display, its horizontal position on the shelf, and its price. By reviewing some researches, they concluded that a brand sale increases when shelf space for an item is increased even when the price and location of the product remains unchanged. Moreover, brands positioned near the centre of the shelf will receive more attention than brands located in the extremities of the display. As those factors are out of the scope of this research, thus they had to be avoided. So, we have chosen to not to position the items on shelves, but display only two items at a time, randomly switching their positions from left to right.

Also, an appropriate lab setup had to be chosen. Distractions, such as noise, opening doors, unusual décor, and other had to be removed. Sunlight and incandescent light contain infrared light, which can create an additional corneal reflection, causing inaccuracies in the data had to be avoided (Bojko, 2013). Good window shades and fluorescent lamps, which does not emit high infrared light levels, were used during the research.

### 1.4.5 *Stimuli*

According to Bigné et al., (2016), most of relevant studies on package design focus on a narrow range of stimuli elements that affect attention, possibly omitting some crucial stimuli elements. So, they suggest employing more integrative research designs to gain more

comprehensive findings. Other researchers have found that attitudes toward overall visual packaging elements influence perceived product quality and preference (Stoll et al., 2008). So, all visual elements must be considered in order to make insights into potential evaluation transfer from package to product (Husić-Mehmedović et al., 2017).

Gaps between stimuli elements must be placed, because the eye tracker accuracy typically fall in a range between 0.5 and 1 degree (Bojko, 2013). So, if a participant is observing an object from a distance of 0.5 meter, that means, that the eye tracker can show the gaze to be placed in an area of 0.01 m. Thus, at least 1 cm gap should be left between the stimuli elements.

A prototype package of a particular product category is important for a customer. Although customers may be attentive to package designs which contrast from category prototype, it seems that they tend to prefer products that are proto-typical for a product category (Barnes & Ward, 1995; Schoormans & Robben, 1997). Thus, it was important to identify and respect common category-based prototypes for the mocked-up products in this research.

### 1.4.6 *Metrics*

Two categories of measures were used during this study – measures of area noticeability and measures of area interest (see the Table 1-4). Measures of area noticeability help determine how easy the element is to notice. Measures of area interest help assess how much interest the element received once it was noticed. These measures are often used to evaluate the effectiveness of product packaging (Bojko, 2013).

***Table 1-4: Measures used in eye tracking***

Adjusted from Bojko, 2013

| **Measure category** | **Measure** |
|---|---|
| Measures of area noticeability | Percentage of participants who have noticed the element |
| | Time spent before noticing the element (time to first fixation) |
| | Number of fixations before fixation on the element |
| Measures of area interest | Time spent on observing the element (total fixation duration) |
| | Number of fixations on the element (fixation count) |
| | Percentage of time on the element |

### 1.4.7 *Participants*

In eye tracking approach there are quit strict requirements for the participants (Bojko, 2013). Participant's vision must be sufficiently good to participate in the study with no glasses or contact lenses, because people with no eyewear tend to track better than people wearing glasses or contacts. Some eye-trackers are compatible with glasses, but even then they are, the participant's eyes must have a single optical power and the glasses must be wide enough and also with slim frames. They should not have strabismus. As seniors are more difficult to track than younger participants, usually the younger participants are preferred. Participants cannot use mascara during the research, because dark-pupil eye trackers can confuse the pupil with mascara-covered lashes. To avoid wrong interpretations, the participants' reading patterns must be taken in consideration as in the Western system people visually examine objects from left to right and up to down, but in the Arabic system they have different patterns.

As for the number of participants, according Simmons, Nelson, & Simonsohn, (2011), 20 observations per cell is enough to detect the most effects.

# CHAPTER 2
# SYSTEMATIC LITERATURE REVIEW

## 2.1 **Introduction**

According to commonly used Cochrane Collaboration established definition, a systematic review is a review of an established question that uses systematic and explicit methods to identify, select, and critically estimate relevant scientific research, and to collect and analyse data from the studies that are included in the review (Higgins & Green, 2008). Quantitative statistical (meta-analysis) or qualitative methods to analyse the data from included studies may be used.

The aim of this study was to evaluate customers' visual attention towards SR or organic product labels on food and in particularly aquaculture and fishery produce through a systematic review of the scientific literature. While addressing visual attention we considered eye tracking approach. To our knowledge, there are no previous systematic literature reviews fulfilling the particular aim.

Research on customers perception of labelling has traditionally focused on a more self-report-based stated preference surveys (Graham, Orquin, Visschers, 2012). Anyway, during this kind of research consumers may overestimate the rates of label use and comprehension (Grunert et al., 2010), while eye-tracking offers to track the location and duration of visual attention precisely (Bojko, 2013).

## 2.2 **Procedure**

We have adjusted a flowchart for the procedures (see the Figure 2-1) according to several researchers, including Ahn and Kang (2018) as well as Moher et al. (2009) to implement the systematic literature review. The flowchart includes five major steps of a systematic literature review abundantly discussed in scientific literature. We discuss those steps in the following text.

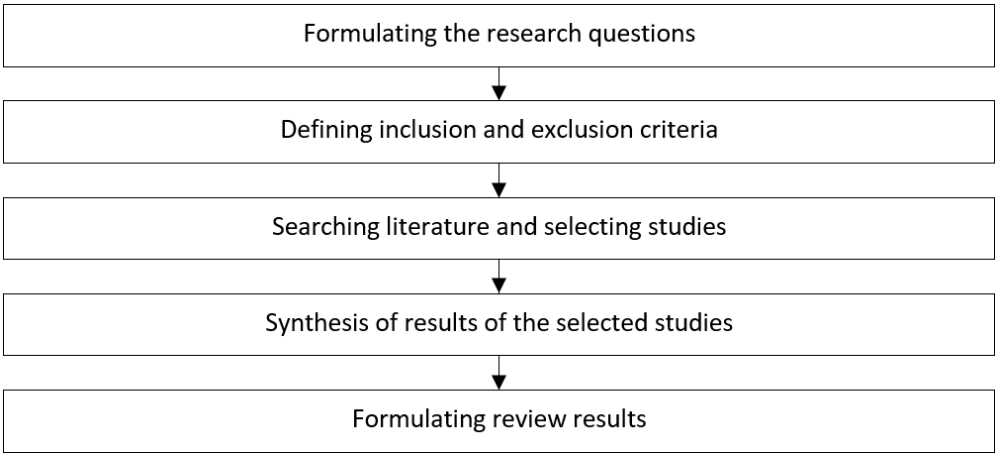


***Figure 2-1: The flowchart of the systematic review procedure***

2.2.1 *Research questions*

In order to fulfil the research aim the following research questions were established:

1) What factors may increase the visual attention to a sustainability-related (SR) or organic label on food produce?

2) Does higher visual attention to a sustainability-related (SR) or organic label increase the purchase intention?

2.2.2 *Inclusion and exclusion criteria*

To analyse the established questions only relevant articles had to be taken into consideration. Thus, clear inclusion and exclusion criteria regarding the area of research, research method and document type were applied (see the Table 2-1). Additionally, relevant publication year were limited because both SR or organic labels and eye tracking research were scarce before 2000. Language limitations were also applied as no possibilities to efficiently translate the article text were possessed.

***Table 2-1: The inclusion and exclusion criteria***

| **Object** | **Inclusion criteria** | **Exclusion criteria** |
|---|---|---|
| *Area of research* | Agricultural and biological sciences; Business management and accounting; Decision science; Economics, Econometrics and Finance; Psychology; Social Sciences; | Medicine, Engineering, Computer Science, Neuroscience Show, Biochemistry, Genetics and Molecular Biology, Mathematics, Physics and Astronomy, Materials Science, Chemical Engineering, Arts and Humanities, Health Professions, Pharmacology, Toxicology and Pharmaceutics, Chemistry, Earth and Planetary Sciences, Energy, |

| | | |
|---|---|---|
| | Multidisciplinary; Environmental sciences | Immunology and Microbiology, Decision Sciences, Nursing, Dentistry, Veterinary, etc. |
| *Research method* | Eye tracking | Absence of eye tracking method |
| *Document type* | Peer-reviewed article | Any other |
| *Publication year* | From 2000 to July, 2019 | Before 2000 and after June, 2019 |
| *Product* | Any food or beverage for human consumption; or only aquaculture or fishery produce for human consumption when indicated in search keywords | All other: decorative plants, electricity items, etc. |
| *Label type* | Organic or SR (fair trade, animal welfare, carbon footprint, Rainforest Alliance, etc.) labels | Nutritional, recyclability or other labels |
| *Language* | English | Any other |
| *Geography* | All | None |

Most of the inclusion and exclusion criteria were set for automatic detection on the search engine. But, in case of research method as well as general context (some of the keywords used have several different meanings) the articles were refined by screening the requirements for titles, abstracts and keywords. No geographical limitations were applied.

### 2.2.3 *Selection of studies*

The scientific, peer-reviewed articles were selected for this systematic literature review. To collect all the existing empirical studies several search engines were employed: Scopus®, Web of Science and EBSCO host. Scopus® is the largest abstract and citation database of peer-reviewed literature with 37,461 journals (Elsevier, 2019).

To establish the initial filter for identifying the articles of interest comprehensive search strings were designed (see the Table 2-2).

***Table 2-2: Search strings used***

| **Search string** | **Keywords** |
|---|---|
| S1 | Organic* OR sustainab* OR eco-label* OR eco* OR krav* OR bio*OR naturland OR (soil association) OR caae OR icea OR debio OR msc OR ggn OR asc OR (friend of the sea) OR wwf OR ethical |
| S2 | Aquacult* OR anchovi* OR bass* OR bream* OR sea-bass* OR sea-bream* OR Carp* Or Catfish* OR Caviar* OR Char* OR Clam* OR Coalfish* OR cobia* OR Cod* OR Crab* OR Crayfish* OR Crangon* OR crustacean* OR Cuttlefish* OR Dab* OR echinoderm* OR Eel* OR finfish* OR fish* OR flounder* OR Gilt-head* OR Haddock* OR Hake* OR halibut* OR Herring* OR Lobster* OR Mackerel* OR Meagre* OR mytilus* OR mollusc* OR Monk* OR Mullet* OR Mussel* OR Octopus* OR Oyster* OR pangasius* OR Perch* OR Pike* OR Pike-perch* OR Plaice* OR Pollack* OR |

| | |
|---|---|
| | pompano* OR Prawn* OR Saithe* OR Salmon* OR salmonids OR Sardine* OR Scabbardfish* OR scallop* OR Seabass* OR seabream* OR seafood* OR shellfish* OR Shrimp* OR snapper* OR Sole* OR Squid* OR Sturgeon* OR Tench* OR tilapia* OR Trout* OR tuna* OR Turbot* OR Whiting* |
| S3 | Label* OR logo* OR certif* |
| S4 | (Eye tracking*) OR eye-track* |

The search strings were designed by the author according to all the background information laid down in the first chapter of this paper. While choosing the species list various statistical sources were analysed, including the EU fish market report (European Commission, 2018). The search strings were applied to titles, abstracts or keywords of an article.

The study selection were based on the a four-phase flow diagram of the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) statement approach (see the Figure 2-2 and the Figure 2-3; Moher et al., 2009). In case of search inquiry "S1 AND S2 AND S4" (see the Figure 2-2), the screening revealed that most of the articles were of another area of research – medicine, psychology, biology. The later step of full-text analysis showed that none of the articles left meet the requirements of the research questions. Only one of the nine articles analysed fish produce, but it was not labelled by SR or organic label.

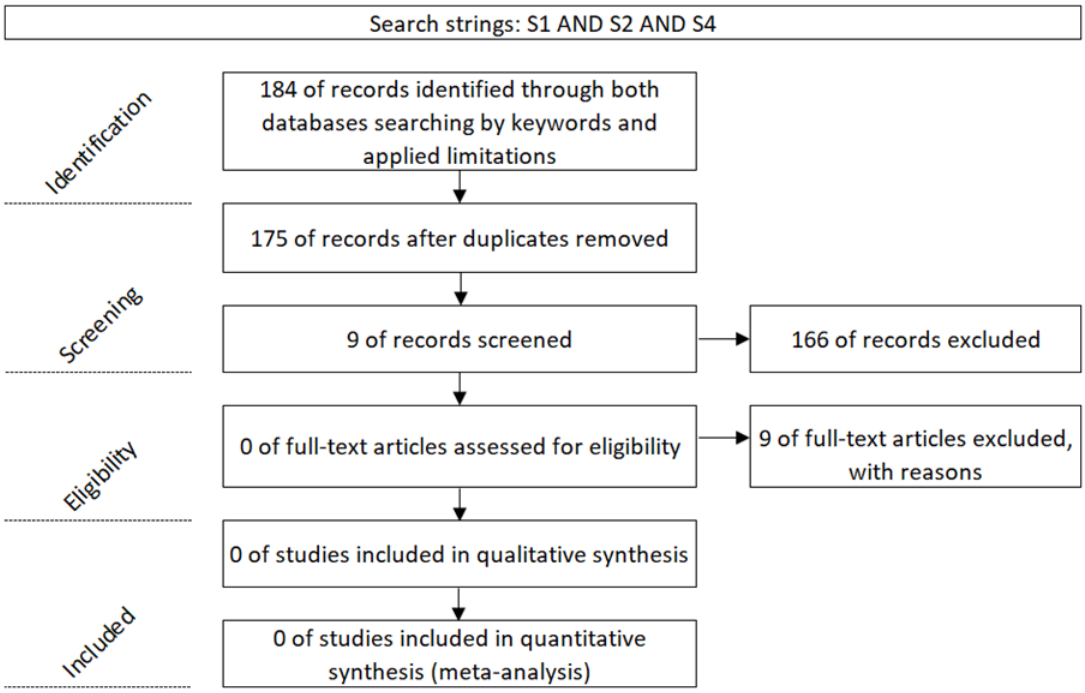


***Figure 2-2: The four-phase flow diagram of the PRISMA statement approach for study selection from the articles derived by search inquiry: S1 AND S2 AND S4***

In case of search inquiry “S1 AND S3 AND S4” the articles derived were less, but they were more relevant to the research questions (see the Figure 2-3). After screening of 70 articles, 17 of them required more detailed full-text analysis to decide if they are relevant to the research questions. In case of two articles of Van Loo et al. (2015; 2018) the data used was of the same research, so the two articles were merged. Another three articles did not analyse nor SR nor organic label, but country of origin or recyclability labels, or general visual saliency. One more article did not used eye tracking method for visual attention evaluation. And another two did not research a food item, but pants for growing.

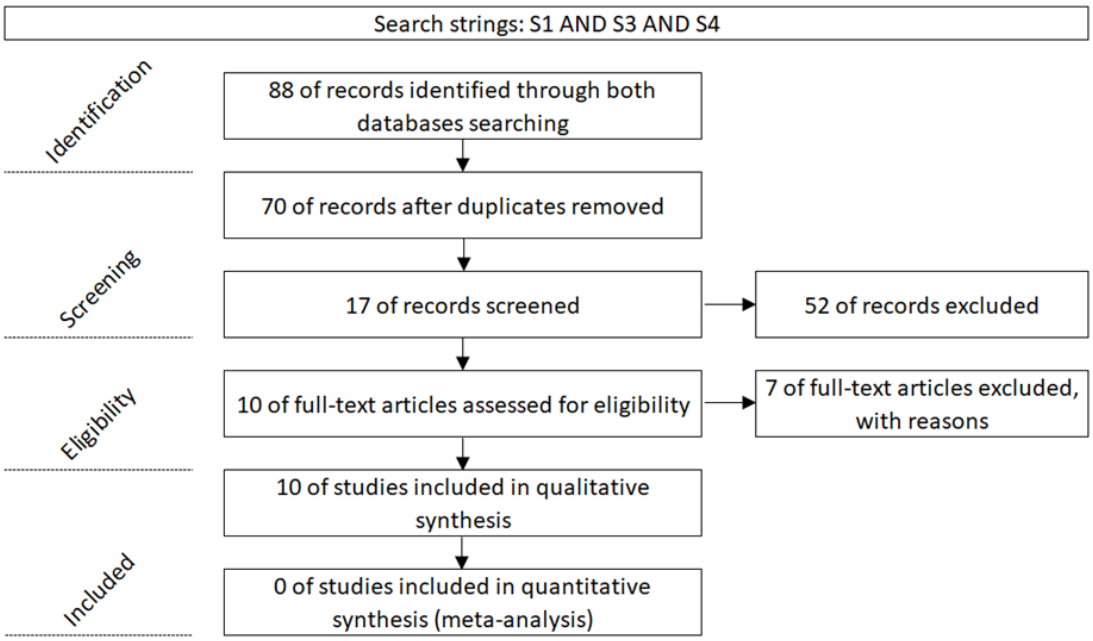


***Figure 2-3: The four-phase flow diagram of the PRISMA statement approach for study selection from the articles derived by search inquiry: S1 AND S3 AND S4***

Thus, only 10 articles, derived by the search inquiry “S1 AND S3 AND S4” were included for the qualitative synthesis.

According to Ahn and Kang (2018), in order to maintain transparency and objectivity throughout this process, study selection should be conducted independently by at least two investigators. Thus, the results of this systematic literature selection was compared with findings of another independent investigator.

### 2.2.4 *Synthesis of findings*

As the data present in these studies are various and the number of relevant studies available are limited, a qualitative review was chosen over the quantitative one. Quantitative reviews

are usually implemented with meta-analyses approach, requiring the articles to possess similar aims, analysis methods and research design, so the outcomes could provide comparable quantitative data (Borenstein, Hedges, Higgins, & Rothstein, 2009). On the contrary, qualitative evidence is more exploratory and may seek to expand understanding of a phenomena (Ring, Ritchie, Mandava, & Jepson, 2010). The results of qualitative synthesis may be displayed in a descriptive form (Ahn & Kang, 2018).

### 2.3 **Results**

The selected articles are very much recent (see the Figure 2-4). The first publication was only issued in 2015 (Van Loo et al.) and the authors of that study confirmed our findings indicating that their study was the first one on the specific topic. The most of the publications were published in 2018 and 2019.

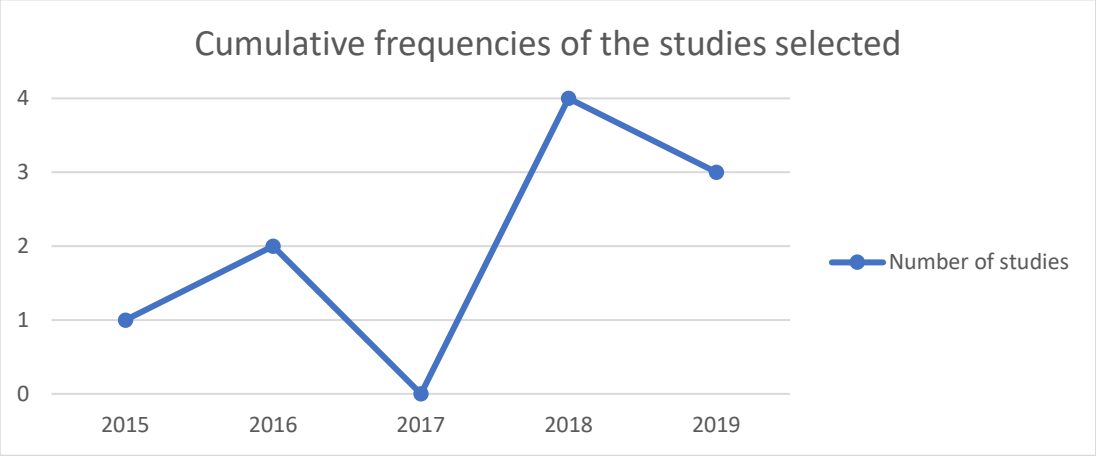


***Figure 2-4: Cumulative frequencies of the studies selected***

Half of the studies selected were implemented in USA (see the Figure 2-5). Regarding the EU, only three countries have published relevant studies: Germany (two studies), Czech Republic (one) and Denmark (one). Japan also have published one relevant study. Although the number of studies are scarce, it covers the three major world continents.

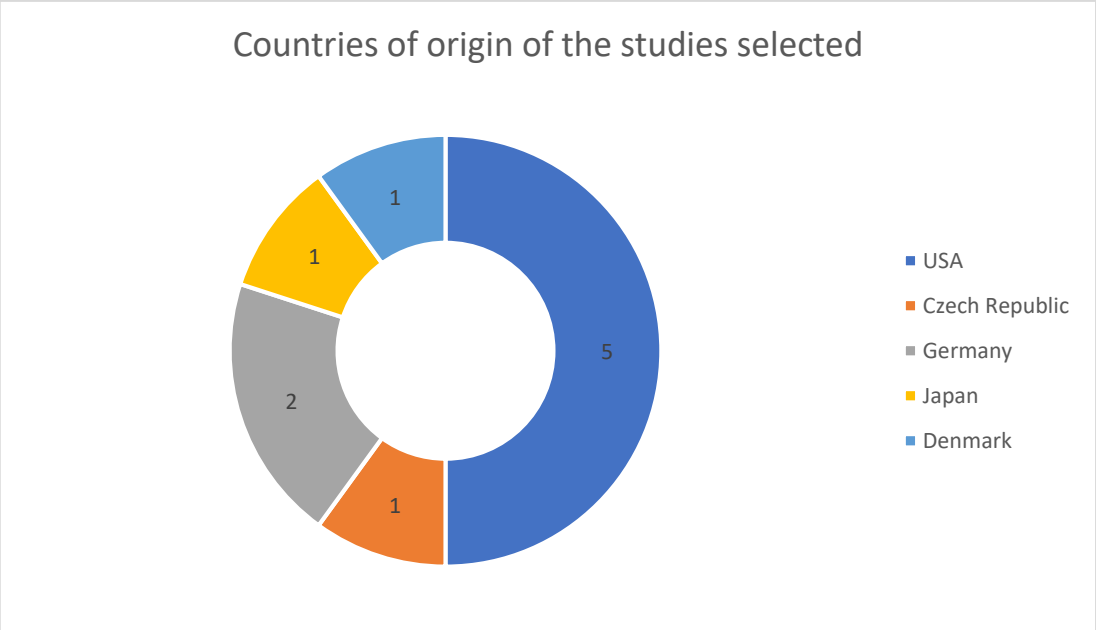


***Figure 2-5: Countries of origin of the studies selected***

The types of labels used in these studies are determined by the countries of origin (see the Figure 2-6). The most prevalent label was the USDA organic label (5 cases). Anyway, if we considered all European organic labels, including Bioland, Naturland, Demeter, EU organic label altogether, then it would be the most prevalent one (8 cases). Probably the most representative sustainability label was the Rainforest alliance label (1 case), which states to include both environmental and social requirements and surely is compatible with the economic development dimension of the sustainability concept. All other labels included sustainability relevant labels which covered a single dimension of sustainability concept – either environmental (Carbon footprint), social fairness (Fairtrade) or animal welfare (Dolphin safe).

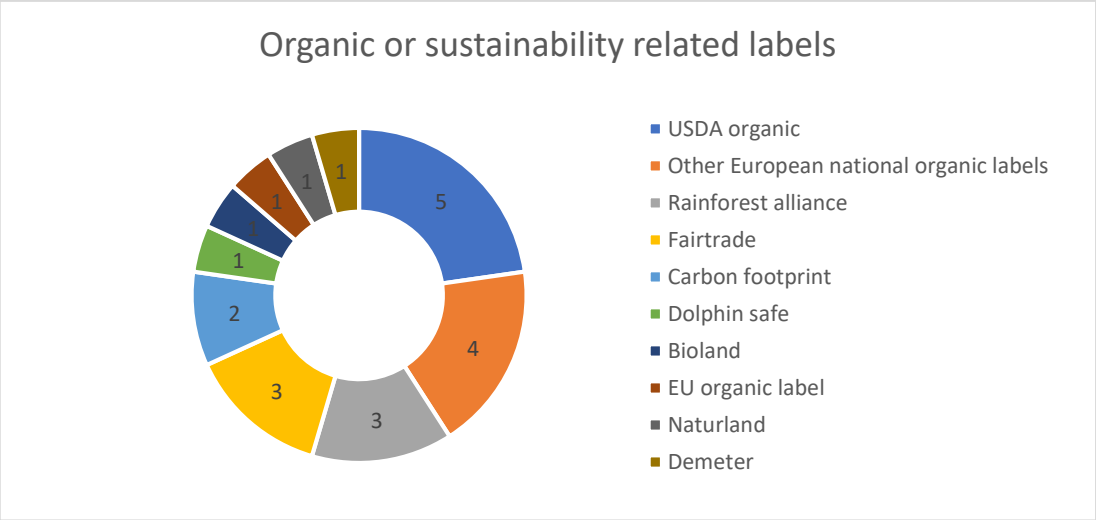


***Figure 2-6: Organic or sustainability-related labels used in the studies selected***

Regarding the food items used in the studies there were no fish products (see the Table 2-3). They were various and only few of them were researched more than once – apples, tomatoes and coffee. We do not take in consideration the effect of a product type in our study.

***Table 2-3: Food type of the studies selected for the qualitative synthesis***

| Food | Cases |
|---|---|
| Apples | 2 |
| Tomatoes | 2 |
| Various | 2 |
| Coffee | 2 |
| Chocolate | 1 |
| Sweet corn | 1 |
| Blueberry | 1 |
| Apple juice | 1 |
| Salad mix | 1 |
| Chicken meat | 1 |
| Yoghurt | 1 |

### 2.3.1 *What factors increase the visual attention towards the labels?*

According to background information on eye tracking methodology (see the subchapter 1.5) there are several factors which may increase the visual attention towards a visual stimuli:

- Top-down or voluntary intent factors
    - Perceived value and/or interest,

    - Awareness, knowledge, familiarity and/or experience,
    - Goal and/or task
    - Other
- Bottom-up or stimulus driven factors
    - Saliency,
    - Surface size,
    - Reduced package clutter,
    - Position,
    - Other

We found plenty of evidence in the studies selected that perceived value of a label influence the visual attention towards the label. In a study of Meyerding and Merz (2018) several research methods employed to research perceived value of six organic labels revealed the common trend indicating that the most valuable labels were the German organic (Bio-siegel) and the Bioland, while the least valuable were a fake label, the EU organic and the Naturland labels. Consequently, the eye-tracking data showed that the EU organic, Naturland and Demeter labels received the least visual attention, while the most attention were focused on the German organic, the Bioland labels and exceptionally the fake label. Thus, the data suggests that in most cases the higher perceived value leads to the higher visual attention. Anyway, there are some exceptions, when taking in account an unfamiliar label which may gather a lot of attention although the value perceived is low. Another study of Meyerding (2018) confirmed that a label type has influence on the visual attention as German organic label received more attention than the Carbon footprint label or Fairtrade or a local Ein Herz für den Erzeuger label when viewed all together. Rihn and Yue (2016) also agreed that consumers' visual attention increased for important product attributes such as organic label or place of origin. The argument was also supported by Van Loo et al. (2015) who have also found in their research that higher valued attributes exhibited higher visual attention. Although the labels did not receive the most attention in competition with price, but the importance of Fair Trade, USDA Organic and Rainforest Alliance were positively correlated with the fixation counts and fixation time for the respective labels. However, despite the above-mentioned arguments there might be some ground for doubts as Meyerding (2018) after researching sustainability and organic labelled tomatoes concluded that no significant relationship between part-worth utilities and the eye tracking measures were observed. Anyway, an explanation is suggesting that this might had happen because during the eye tracking examination no task to make a purchase or preference decision was given.

The findings on the role of consumer awareness or familiarity with a label is contradictory. Rosbergen et al., (1999) have noticed that abundant familiarity may lead to decreased visual attention, and thus the opposite may also be true. We found some evidence to this remark as although a fake label were perceived as of low value, it received the most visual attention in the study of Meyerding and Merz (2018). On the contrary, Samant and Seo (2016) figured out that enhanced label-knowledge increased consumers' visual attention to sustainability or organic labels. Anyway the procedures chosen in their study may had have some kind of effect as educational activities and questionnaires on awareness were given for the "high label-understanding" group as well as the same questionnaires for the control group before the eye tracking research. Thus the participants may had have anticipated the objectives of the study. Takahashi, Todo and Funaki (2018) have recently done a research in Japan with Rainforest Alliance label. They provided a detailed explanation of the certification program to half of the participants through random selection. And they found that participants who received the educational information surprisingly gave even less attention to the particular label on coffee products. The data may point out the effect of decreased attention due to abundant awareness. Another explanation may be that the customers in Japan found the label to be of low importance. The importance of such label was also doubtful in another research done by Van Loo et al. (2015). When evaluating the coffee attributes, participants attached the highest importance to the flavour followed by the price, type of roast and in-store promotions. But the sustainability labels were perceived as less important compared to other coffee attributes, moreover the USDA Organic and Fair Trade were perceived as more important than the Rainforest Alliance label.

The study of Meyerding (2018) showed that a task to make a purchase decision is influencing the way a customer gives his visual attention towards a product package. In absence of a goal or a task, the attention may be more scattered.

Another top-down factor, the gender of the customer did not have major influence on the visual attention towards eco-labels (Drexler, Fiala, Havlíčková, Potůčková, & Souček, 2018).

When talking about the bottom-up factors, Peschel, Orquin and Loose (2019) have studied attention capture towards a larger and more visually salient label. The increased size of a label received increased attention. But manipulations in saliency by changing the contrast of the label colour to the background colour did not show significant difference. Meanwhile, synergy effect was obtained when both factors were combined as a strong and significant increase in attention capture towards both larger and more visually salient label were observed.

Another important factor which may reduce the attention towards the organic or SR labels is visual clutter. Takahashi, Todo and Funaki (2018) found that when more elements were present on a package less attention were given to the Rainforest Alliance label.

And finally, the type of visualization used has its role as a logo tends to attract attention quicker and hold it for longer compared with a text label (Katz, Campbell, & Liu, 2019).

We could not find any research data considering the position of the relevant labels.

Song et al. (2019) have recently published an outstanding study with the most realistic setting in a real market environment (meanwhile all other of the selected studies were implemented in a lab environment). They revealed some cogent findings about real life consumer behaviour towards the organic and sustainability labels. During the study 156 participants purchased 1,544 products, from which 110 had organic or SR label on their package. It is important to mention that the market was ordinary but not a high-end store that specializes in healthy and natural food. However, the majority of participants (54%) did not evaluate any product information at all for any of the items they purchased, while only some (10%) of the products purchased from all participants were evaluated. Moreover, competing with other product information, organic or SR labels received little attention from consumers indicating the influence of visual clutter. In case of products with organic or SR labels, the most visual attention were given to nutritional information and ingredients list. These findings points out the limitations of the labels. Out of the 110 organic or SR products, the labels received significant attention by the participants only in case of 2 products. These findings contradicts to the studies done in a lab environment which indicates that majority of participants pays attention to the particular labels. The authors suggest that the lab research may not represent the true customer behaviour because of several reasons, such as:

- The participants in a lab setting are not familiar with the provided products and cannot employ their habitual shopping criteria;
- Their time at the moment is dedicated to the experiment, thus the participants had nothing else to do but to read the labels;
- They feel influence spur by social expectation to pay attention to the information that they normally would ignore.

The authors of this study suggest that the visibility of the labels need to be improved.

### 2.3.2 *Does higher visual attention to the labels increase the purchase intention?*

The question of the effect of visual attention on the purchase decision is controversial in the scientific literature.

In the study of Meyerding and Merz (2018) the correlations between visual attention to organic labels and purchase choice were low. Also, in case of a never seen fake label, high visual attention did not help to gain purchase. Rihn and Yue (2016) in case of organic label on salad mix observed no significant increase in WTP while the visual attention increased. Regarding fixations on local and domestic attributes, they neither had significant impact on participants' WTP for apple juice. In case of Rainforest Alliance label, Takahashi, Todo and Funaki (2018) no statistical association was found between the proportion of the total fixation duration on the certification label and purchasing behaviour.

Anyway other findings suggest contrary conclusions. Rihn and Yue (2016) in case of apple juice found that participants who fixated more on organic label were willing to pay a price premium for the product. Peschel, Orquin and Loose (2019) in a study with Danish organic logo have found that the effect of increased attention capture by means of increased label size and saliency carried over into increased choice likelihood. Samant and Seo (2016) noticed that increased visual attention to sustainability or organic labels may translate into positive purchase behaviour. Moreover, Van Loo et al. (2015) confirms those findings as their study results suggested that people who visually attend more to SR or organic labels are more likely to choose coffee produce carrying these labels. In more detail, a unit increase in fixation count on a particular sustainability label resulted in an increase of WTP of 5.9% for USDA Organic, 7.4% for Fair Trade, 2.1% for Rainforest Alliance and 9.0% for the Carbon Footprint label. As well as, a unit increase in fixation time resulted in an increase of WTP of 22.9% for USDA Organic, and 23.6% for Fair Trade, 4.9% for Rainforest Alliance and 29.2% for the Carbon Footprint label.

It is necessary to stress that the higher visual attention towards unfavourable attributes may also decrease purchase intentions as more fixations on the import attribute resulted in a decreased WTP for apple juice (Rihn & Yue, 2016).

In comparison to previous findings from lab-based studies, Song et al. (2019) remarks that the particular labels have very low influence in real market situation. In their outstanding real market setting study products with organic or SR labels were purchased although the participants paid no attention to the particular labels. The post-shopping interview revealed that many of the customers did not realize that the products they purchased had the labels.

# CONCLUSIONS

1) The global fish supply is largely dependent on few regions which employs intensive, not sustainable techniques and large-scale production. Meanwhile, the European fish production is still based on fisheries as the aquaculture sector is slowly developing. To enhance the development of European aquaculture sector quality certification programs and proper communication could be sufficient means.
2) There are plenty of various organic and sustainability as well as sustainability-related and other social, geographical indication, nutritional and other labels in EU markets. The variety might create a clutter and customer doubts.
3) Consumers possesses a generally negative opinion about the impact of aquaculture practices on the environment and they prefer wild capture to aquaculture production. As the global fisheries are not having the capacity of feeding the growing demand prompt, proper and abundant communication tools should be employed to deal with wrong customers' assumptions.
4) Eye tracking is a modern and efficient technique to monitor a customer's visual attention and may be successfully used in marketing and communication fields.
5) The number of selected studies reveals that the literature investigating the visual attention paid by consumers to the sustainability or organic labels on food is very much scarce. No eye tracking experiment have been done to investigate sustainability or organic labels on fish produce yet.
6) There are rather sufficient evidence that customers' visual attention towards organic and sustainability-related labels on food produce may be induced by higher perceived value or interest.
7) The findings on the role of consumer awareness or familiarity with the label are contradictory. There are some findings which suggest that higher knowledge induce higher visual attention, but also abundant familiarity may lead to decreased visual attention explained by less time needed for examination, and thus the

opposite may also be true for a newly seen label which may require a lot of time for its examination.

8) The other important top-down factor is a goal of visual examination as according to one study during a pointless process the attention may be more scattered.
9) In one of the studies the gender of a customer were found to have no major influence on their visual attention towards organic or sustainability-related labels on food produce.
10) A single study were found considering the size and saliency of a label. A bigger size of a label may increase the visual attention. Saliency in terms of colour have been found to have minor influence. But a combination of both of these factors results in a synergy.
11) There are some evidence in two of the studies that visual clutter on a package may reduce attention toward the labels.
12) A single study suggests that an image format of a logo tends to attract attention quicker and hold it for longer compared with a textual logo.
13) The only study in a real market environment argue that customers spend almost no time for visual examination of organic or sustainability-related labels during a casual shopping activity although they do buy the food produce with the particular labels.
14) As the findings on factors of visual attention and their effect is contradictory even more complex are the findings on the visual attention influence on purchase decision. In general, several studies indicated that higher visual attention may translate to more purchases or price premiums. But another several studies argue that there was no correlations between visual attention and purchases. Thus, the causes of increased visual attention should be taken into consideration. In case of undesirable or newly seen labels the visual attention may be high but the purchase intention very low.

# PROPOSALS

1) Research investigating sustainability or organic labels on fish produce could provide with some useful insights on customer visual attention during shopping process. It may help to adapt and develop the organic and sustainability labels to eventually increase the customers' visual attention and purchase intention.
2) The wide variety of quality labels in EU market may create clutter and doubts for customers. The issue may be solved by strict regulations or even prohibition of first- and second-party labels which are closely related to the food business operators and thus may be influenced by them.
3) Future research on visual attention towards sustainability and organic labels could include wider range of the labels and consider the position of the label, visual clutter, visual saliency, customer reading patterns, combination of textual logo and relevant label on the same front of package and other less researched factors. Moreover, as previous studies most often relied on computer screen setting, a mocked-up 3-dimensional package with all ordinary visual elements or a real market setting with casual shopping task may be a more realistic approach.
4) As some studies revealed low visual attention for EU organic label, thus the issue could be further researched and suggestions for better communication could be derived. Some private label owners communicate the EU organic regulation for aquaculture as being of lower standards. Those communications could be monitored. Also, the standards could be held to ensure the expected quality of the produce in other case customers' trust may be endangered.
5) Fish business operators could use high-value organic and sustainability labels in a salient manner as increased attention may translate to higher purchase intention and reduce visual clutter on front of the package as it reduce the attention towards most important visual elements.

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# ANNEX I

***Reference list of the selected studies***


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# ANNEX II

***Table 0-1: Details of the selected studies.***

*C. – country; N – number of participants; Setting – setting for the eye tracking approach; DPP – number of displays per participant; Labels – organic or sustainability-related labels; Methods – additional methods along with eye tracking; Metrics – eye tracking metrics.*

| C. | N | Setting | Products | AOIs | DPP | Labels | Methods | Metrics | Reference |
|---|---|---|---|---|---|---|---|---|---|
| USA | 81 | Screen with pictures of mocked-up packages | Coffee | 4 sustainability labels, 4 price values | 8 | Rainforest alliance, USDA organic, Fair trade, Carbon footprint | Choice experiment, survey on attitudes | Fixation time and fixation count | Van Loo et al., 2015 and 2018 |
| USA | 98 | Screen with pictures of mocked-up packages and an experimental auction | Apple juice, salad mix | 3 production method options, 4 places of origin options, 2-3 nutrient content claim options | 16 | USDA organic | Experimental auction, questionnaire | Bids made, number of fixations | Rihn, Yue, 2016 |
| USA | 58 | Screen with photos of adjusted real market product packages | Chicken meat | 4 label options, 3 brands, instructions, 2 meat types, price, appearance, indicator date, weight | 6 | USDA organic | Purchase choice experiment, questionnaire on preference with 9-point rating scale | Fixation time and fixation count | Samant, Seo, 2016 |

Continued on the following pages.

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|---|---|---|---|---|---|---|---|---|---|
| Czech Republic | 147 | Screen with photos of adjusted real market packages | Nine different food items | 5 ecolabels, place of origin, other labels, contents, brand, graphics, claims, product name, flavour, lid | 9 | 5 different ecolabels of Czech Republic | In-depth interviews | Heat maps - fixation duration | Drexler et al., 2018 |
| Germany | 73 | Screen with pictures of mocked-up packages | Apples | 6 price values, 6 places of origin, 7 label options | 49 | Demeter, Naturland, European organic label, German organic label, Fake label (Swiss organic label), Bioland | Choice-Based Conjoint Analysis, Other Applied Stated Preference Approaches | Fixation duration, fixation count, visit duration, visit count | Meyerding, Merz, 2018 |
| Germany | 17 | Screen with photos of adjusted packages | Tomatoes | 5 price values, 5 places of origin, 5 label options | 25 | German organic label ("Bio-siegel"), Fairtrade, Carbon footprint | Choice-based conjoint analysis | Visit duration, visit count, average fixation duration, and fixation count | Meyerding, 2018 |
| Japan | 246 | Screen with pictures of mocked-up packages | Coffee | 2 label options, 3 product type options, 4 package design options | N/A | Rainforest alliance | Preference experiment, Purchase choice experiment, questionnaire | Total fixation duration | Takahashi, Todo, Funaki, 2018 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| USA | 156 | A real local supermarket | Various food items | 7 ecolabels, brand, ingredient, instruction, nutrition, price, description, use-by date, etc. | N/A | Dolphin Safe, Fair trade, Non-GMO, Rainforest alliance, Transitional certified by QAI, USDA organic, Certified Humane | Purchase choice experiment, questionnaire, interview | Time spent on AOIs, first evaluated AOI | Song et al., 2019 |
| Denmark | 127 | Screen with pictures of adjusted packages | Chocolate, tomatoes, yoghurt | 4 label options in versions varying in size and saliency | 15 | Danish organic label | Choice experiment | Fixation likelihood | Peschel, Orquin, Loose, 2019 |
| USA | 255 | Screen with photo of a package and AOI elements nearby | Apple, blueberry, sweet corn | 6 place of origin indication options, 4 price values, 4 production method indication options | 8 | USDA organic | Purchase experiment, questionnaire | Time to first fixation, first fixation duration, total visit duration, fixation count | Katz, Campbell, Liu, 2019 |